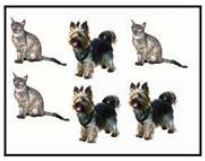
MO MATH
NATIONAL MUSEUM OF MATHEMATICS

Level 1

1. In which picture are there 2 more cats than dogs?

A. 

B. 

C. 

D. 

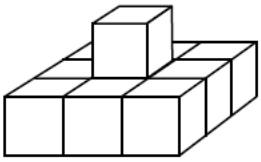
2. Elma took 2 candy bars to school. First, she traded each of them for 4 apples, and then she traded each of the apples for 3 mandarin oranges. How many mandarin oranges did she have after this trading?

A. $2+4+3$ B. $2\times4+3$ C. $2+4\times3$ D. $2\times4\times3$

3. There are equal numbers of cats, dogs, and chickens in the yard. Together, they have 50 legs. How many cats are there in the yard?

A. 4 B. 6 C. 5 D. 7

4. The figure shown in the picture below is built of identical wooden cubes. How many cubes were used to build it?



A. 12 B. 8 C. 9 D. 10

Problems selected from Math Kangaroo

5. Anna performed two operations. She put stickers over some of the numbers — the same stickers over the same numbers.

$21 - 7 =$ 

$2 \times$  $=$  $+ 1$

What number can be found under the  sticker?

A. 15 B. 14 C. 25 D. 27

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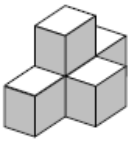
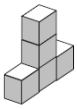
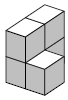
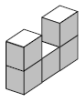
Level 2

1. An adult ticket to the zoo costs $4, and a ticket for a child is $1 cheaper. On a certain Sunday, a father went to the zoo with his two children. How much did they have to pay for the tickets?

   A. 5 B. 6 C. 7 D. 10 E. 12

2. Each of the figures A to E shown below is made up of 5 blocks. Which of the figures can you not get from the figure on the right if you move exactly one cube?

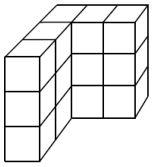


   A.  B.  C.  D.  E. 

3. Right now, Mary is five times as old as her sister Li. In 6 years, she will be twice as old as Li. How old will Mary be in 10 years?

   A. 15 B. 20 C. 25 D. 30 E. 35

4. The figure shown in the picture was made out of identical wooden cubes. How many wooden cubes were used?



   A. 6 B. 8 C. 10 D. 12 E. 15

5. A red kangaroo and a gray kangaroo together weigh 139 kg. The red kangaroo weighs 35 kg less than then gray kangaroo. How much does the gray kangaroo weigh?

   A. 104 kg B. 52 kg C. 87 kg D. 96 kg E. 53 kg

Problems selected from Math Kangaroo

6. A certain vase contains four flowers: one red, one blue, one yellow, and one white. Maia the Bee sat on every flower in the bouquet only once. She started with the red flower, and she did not fly directly from the yellow flower to the white flower. In how many ways could Maia sit on all the flowers?

   A. 1 B. 2 C. 3 D. 4 E. 6

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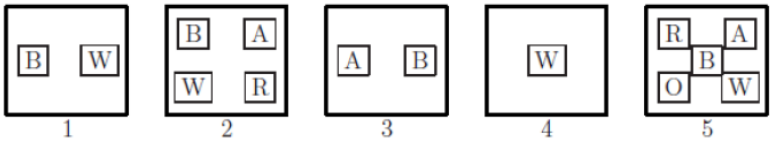
Level 3

1. Which number is the smallest?

   A. 2 + 0 + 0 + 8 B. 200 ÷ 8 C. 2 × 2 × 2 D. 200 - 8
   E. 8 + 0 + 0 - 2

2. There are five boxes as shown in the picture, and each one contains cards with different letters. Paul wants to remove cards from the boxes in such a way that there is only one card left in each box, and that every box has a card with a different letter in it. Which card will be left in box 5?

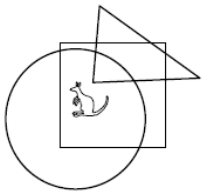


   A. B B. R C. A D. W E. O

3. A train traveling at a steady speed crossed a bridge which was 200 m long in 1 minute. The whole train passed a person standing on the bridge in 12 seconds. How long was the train?

   A. 100 m B. 60 m C. 50 m D. 40 m E. 75 m

4. Where is the kangaroo?



   A. In the circle and in the triangle, but not in the square.
   B. In the circle and in the square, but not in the triangle.
   C. In the triangle and in the square, but not in the circle.
   D. In the circle, but not in the square and not in the triangle.
   E. In the square, but not in the circle and not in the triangle.

Problems selected from Math Kangaroo

5. A certain dance group started out with 39 boys and 23 girls. Every week, 6 more boys and 8 more girls joined the dance group. After a few weeks, the number of boys and the number of girls in the dance group was equal. How many participants were in the dance group at that time?

   A. 144 B. 154 C. 164 D. 174 E. 184

6. Jane multiplied the product of 18 factors, each equal to 8, by the product of 50 factors, each equal to 5. How many digits does her final product have?

   A. 13 B. 40 C. 52 D. 60 E. 100

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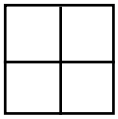
Level 4

1. The numbers 2, 3, 4, and one more number are written in the cells of a 2 x 2 table. It is known that the sum of the numbers in the first row is equal to 9, and the sum of the numbers in the second row is equal to 6. The unknown number is:



A. 4 B. 5 C. 6 D. 7 E. 8

2. How many squares can be drawn by joining the dots with line segments?

A. 2 B. 3 C. 4 D. 5 E. 6

3. In the equation KAN – GAR = OO each letter represents a certain digit (different letters represent different digits, the same letters represents the digits). Find the largest possible value of the number KAN.

A. 987 B. 876 C. 865 D. 864 E. 785

4. What is the minimum number of dots that need to be removed from the given figure so that no three of the remaining dots are collinear?

A. 3 B. 4 C. 2 D. 7 E. 1

5. An island is inhabited by two types of people: truth-tellers and liars. The truth-tellers always speak the truth and the liars always lie. 25 of the island's inhabitants stood in a line. Each of them, with the exception of the first person, said: *The person directly in front of me is a liar*, while the person standing first in the line said: *Everyone standing behind me is a liar*. How many liars stood in the line?

A. 24 B. 13 C. 12 D. 0 E. impossible to determine

Problems selected from Math Kangaroo

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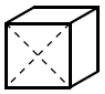
Level 5

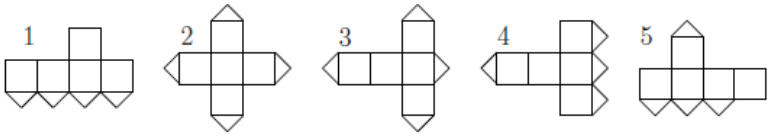
1. How many of the following expressions have a value different from 6?

$$2-(-4),\ (-2)\times(-3),\ 2-8,\ 0-(-6),\ (-12)\div(-2)$$

A. 0 B. 1 C. 2 D. 4 E. 5

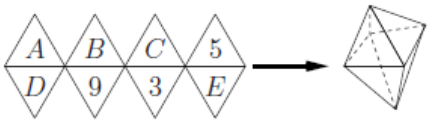
2. Imagine that the cube in the diagram is cut open along the dotted lines and unfolded. Two of the given configurations are impossible. They are:





A. 1 and 3 B. 1 and 5 C. 3 and 4 D. 3 and 5 E. 2 and 4

3. A configuration of 8 equilateral triangles may be glued together to form a regular octahedron, as shown. A magical octahedron is obtained by replacing letters A, B, C, D, E with numbers 2, 4, 6, 7, 8, each letter with a different number and not necessarily in that order, in such a way that the sum of the values of the 4 faces adjacent to any one vertex is always the same. In a magical octahedron the value of B + D will be:



A. 6 B. 7 C. 8 D. 9 E. 10

4. Which of these is a multiple of 3?

A. $2{,}009$ B. $2+0+0+9$ C. $(2+0)\times(0+9)$
D. 2^9 E. $200-9$

5. Borromean rings have the property that they cannot be separated without cutting, but when any one ring is removed the remaining two are no longer linked. Which figure represents the Borromean rings?

A.  B.  C.  D.  E. 

Problems selected from Math Kangaroo

6. A student who had 2,009 cubic blocks of side length 1 and 2,009 square colored stickers of side length 1 built a rectangular prism and completely covered the surface with the stickers making sure that none of them overlapped. It turned out that some stickers were not used. How many stickers were left over?

A. more than 1,000
B. 763
C. 476
D. 49
E. This situation is impossible.

MOMATH
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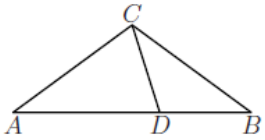
Level 6

1. Given an isosceles triangle $\triangle ABC$, where AC = BC, and point D on the side AB such that AD = AC and DB = DC. what is the measure of the angle $\angle ACB$?

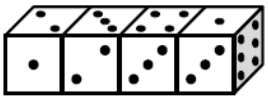


A. 98° B. 100° C. 104° D. 108° E. 110°

2. How many four digit numbers are divisible by 3, have the digit 2 in the thousands place, and have the digit 8 in the ones place?

A. 34 B. 30 C. 19 D. 20 E. 33

3. Four identical dice are arranged as shown. These dice are unlike standard dice in that the sum of the values on opposite faces does not need to equal seven. In this arrangement, what is the sum of the values of the six adjacent faces?



A. 19 B. 20 C. 21 D. 22 E. 23

4. For how many positive integers n is the number $n^2 + n$ prime?

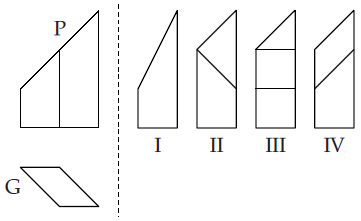
A. 0
B. 1
C. 2
D. More than 2, but finitely many.
E. Infinitely many.

Problems selected from Math Kangaroo

5. 2,009 kangaroos, each either of a pale or a dark hue, compared their height. Only one pale kangaroo was taller than exactly 8 dark kangaroos, only one pale kangaroo was taller than exactly 9 dark kangaroos, only one pale kangaroo was taller than exactly 10 dark kangaroos, and so forth. Finally, only one pale kangaroo was taller than all the dark kangaroos. How many pale kangaroos were there?

   A. 1,000
   B. 1,001
   C. 1,002
   D. 1,003
   E. This scenario is impossible.

6. On the left side of the dashed line are shown the view of a certain building from the south (P) and the top view of this building (G). Which of the figures labeled I, II, III, and IV is the view of this building from the west?



   A. Figure I B. Figure II C. Figure III D. Figure IV E. None of these.